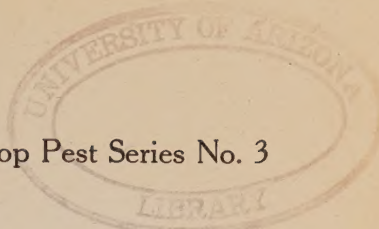


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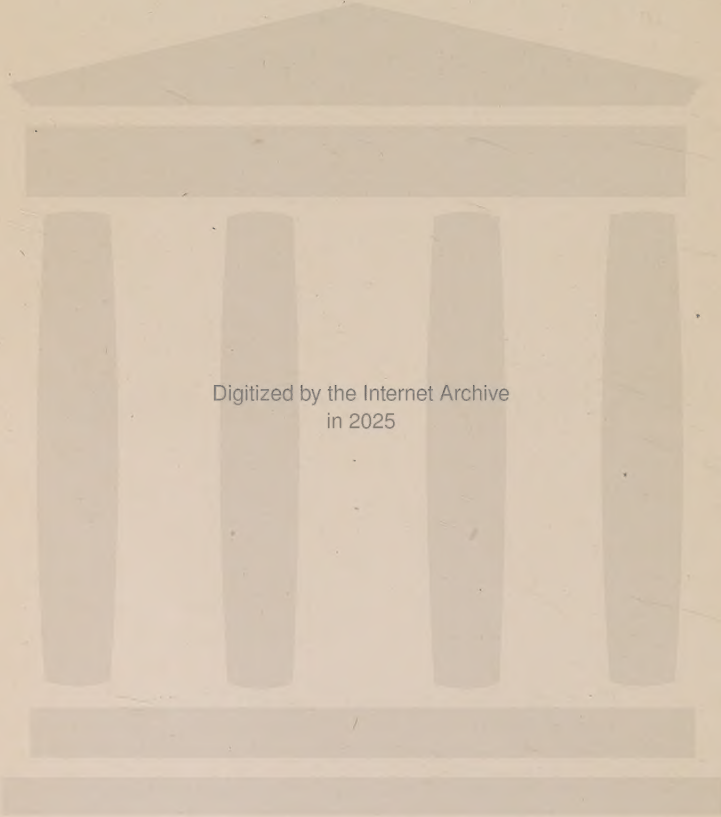


Oregon Agricultural College
And Experiment Station

ORCHARD SPRAYING

BY A. B. CORDLEY AND H. S. JACKSON

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Orchard Sprays and Spraying.

A. B. CORDLEY AND H. S. JACKSON.

Knowledge of a multiplicity of sprays is not essential to success in spraying. Equipped with an understanding of the range of usefulness of three or four standard sprays, with a good pump, and with a determination to do thorough work, one is as well fortified, as may be, against orchard pests and diseases.

While it is true that most growers of experience understand the general theory of spraying, it is considered desirable for the benefit of the novice to emphasize certain fundamental principles, a knowledge of which is essential to the proper selection and use of remedies for orchard diseases or insect pests.

It should first be thoroughly understood that spraying is not a cure all. There are many diseases and some insect troubles of the orchard for which spraying is of no value, either as a preventive or cure.

Fortunately, most of the important orchard pests and diseases may be held under control by proper spraying. It is important to note, however, that in order to do effective spraying against any pest, it is essential that the proper *spray* be used at the proper *time* for that particular pest. A spray which is effective against one pest may be totally ineffective against another, even if applied at the proper time. The proper spray for any pest applied at the wrong time is as useless as no spraying at all.

It is, therefore, of prime importance that every grower should know what diseases and insects are prevalent in his district; that he be able to recognize them when he sees them, and practice the proper methods of control.

The proper time at which a spray should be applied and the proper spray to be used is determined by the life history of the organism causing the trouble, whether it be an insect or a fungus or bacterial disease.

It is not the purpose of this circular to discuss the life history of orchard pests, but rather to give general directions for the preparation and use of the common sprays.

INSECTICIDES.

Under the head of insecticides are included those sprays used primarily to combat insects. To understand the general principle which underlies the selection of the proper remedy to be used for any particular insect, one has only to know that nearly all insects may be divided for practical purposes into two great groups, viz: *chewing* insects and *sucking* insects.

FOOD POISONS. For combating chewing insects, that is those which actually chew and swallow the tissues of the plant on which they feed, a poison must be used. The surface of the parts of the plant on which such an insect feeds must be coated or sprayed with some poisonous substance which will not injure the plant yet will kill the insects which feed upon the parts thus coated.

(a) *Arsenate of Lead.* Arsenate of lead is now the chief poison used in spraying for the codling moth. Many commercial brands are to be had, and so far as our observations go, all are reasonably pure. The various brands may, however, be arranged into two more or less definite groups, which may be termed the Acid Arsenates and the Neutral or Normal or Ortho Arsenates. While the evidence is not conclusive, it appears to be true that the acid arsenates cannot so well be used with the lime-sulfur solutions as can the neutral arsenates.

Most manufacturers advise the use of three pounds of arsenate of lead to fifty gallons of water. The Washington Experiment Station has demonstrated that in the dry climate of Eastern Oregon one pound to fifty gallons gives equally good results in controlling codling moth. We have found that two pounds are sufficient in the Willamette Valley.

If it is desired to use a combined insecticide and fungicide, arsenate of lead may be added to Bordeaux or lime-sulfur solution in the same proportion as when water is used.

CONTACT INSECTICIDES. For combating sucking insects, that is those with sucking mouth parts which pierce the plant upon which they feed and suck the juices, a spray must be used which will kill such insects by acting externally on their bodies, since they secure their food from beneath the surface and cannot be made to eat the poisons. A spray of this sort is known as a *contact insecticide*.

(b) *Kerosene Emulsion.* Kerosene oil, or coal oil, is a powerful insecticide. The undiluted oil is, however, liable

to seriously injure plants to which it is applied. This difficulty is overcome by forming an emulsion with some substance that it may be readily diluted with water. Soap is most commonly added for this purpose, as follows:

Kerosene oil, 2 gallons;

Hard soap (preferably whale-oil), $\frac{1}{2}$ pound;

Water, 1 gallon.

Dissolve the soap in the water by boiling. Add the suds, boiling hot, to the oil. Churn the mixture violently with a spray pump until it becomes a thick creamy mass. If perfectly emulsified, the oil will not rise to the surface even after standing an indefinite time. Such an emulsion may be used immediately or kept as a stock solution. Before using dilute one part of the stock emulsion with eight or ten parts of water.

This will be found to be an efficient remedy for green aphids, woolly aphids, red spider, mealy bugs and certain scale insects.

(c) *Black-Leaf*: Is used especially for plant lice, but may also be used for various other sucking insects, as the leaf-hoppers and the apple tingis. Use in the proportion of one part to sixty parts of water or lime-sulfur.

(d) *Black-Leaf 40*: Is an extremely concentrated form of nicotine sulfate and is now sent out as a substitute for the black-leaf. It is supposed to be as efficient and has the added benefit of being cheaper. Use in the proportion of one part to 800 parts of water or lime-sulfur.

FUNGICIDES.

The term *fungicide* is applied to those substances which will prevent the growth of fungi on plants. The fungi are a group of plants of low order, many of which live as parasites on the higher or flowering plants.

A parasitic fungus is a plant as truly as is the apple tree, the prune tree, or any other plant upon which it may be growing. It differs from the common plants essentially in being much more simple in structure and in being devoid of chlorophyll—the green coloring matter of plants. Its reproductive bodies, which are called spores, are more simple and very much smaller than the smallest seeds of our common plants and are produced in almost inconceivably great numbers. The vegetative portion of the fungus, the part which, in a sense, corresponds to the roots, stems and leaves of ordinary plants, the parts which absorb the food materials and eventually pro-

duce the spores, consist of a mass of more or less branched, white or colorless, and very minute threads, and is called the mycelium.

Being so small and light, the spores are readily carried long distances by the wind, washed about by the rains, and are also carried by birds and insects and probably by other agencies. These agencies are thus largely responsible for the spread of fungus diseases from leaf to leaf, plant to plant, orchard to orchard. Over greater distances the spores may be carried on shipments of infected nursery stock, fresh fruits, vegetables, seeds, etc.

Should a spore fall upon suitable soil, such as the surface of leaf or fruit, and the conditions of heat and moisture be favorable, it will germinate—push out a delicate, slender germ-tube. In the case of most parasitic fungi this germ-tube soon penetrates the epidermis of the leaf or fruit and the mycelium develops in the underlying tissues entirely beyond the reach of fungicides.

The philosophy of spraying for fungus diseases in general is based upon the fact that they cannot be cured, but can be prevented. This germ-tube must be destroyed before it penetrates the epidermis, and to do this the surface of the host must be thoroughly protected by the fungicide during the entire time the spores are germinating.

(a) *Bordeaux Mixture*. Bordeaux mixture has long been the principal spray used as a preventative of fungus diseases of plants, and while other sprays, notably the lime-sulfur mixtures, give promise of largely supplanting it for orchard purposes, it still remains one of the most important orchard fungicides.

Bordeaux for winter use may be made as follows:

Copper sulphate, 6 pounds;

Quick lime, 6 pounds;

Water, 50 gallons.

This is known as the 6-6-50 formula. It should be used only upon dormant trees.

When the leaves are in leaf the following 4-4-50 formula is used.

Copper sulphate, 4 pounds;

Quick lime, 4 pounds;

Water, 50 gallons.

A weaker formula known as the 3-6-50 formula, is sometimes used on plants of tender foliage. In Oregon the formula has been successfully used on the peach foliage for pre-

vention of fruit spot but it is without doubt safer to use the self-boiled lime-sulfur:

Copper sulphate, 3 pounds;

Quick lime, 6 pounds;

Water, 50 gallons.

It is of great importance that Bordeaux be properly made. The mixture must be made fresh each time it is used. The ingredients may be stored in stock solution indefinitely, however. Always use wooden or earthen vessels in preparing Bordeaux or the solution of blue stone.

When large quantities of Bordeaux mixture are required, it is most convenient to have stock solutions made up containing one pound per gallon of the respective ingredients. Take a fifty gallon barrel of water and suspend near the top a coarse sack containing fifty pounds of crystalized or granulated commercial copper sulphate. It will dissolve in a few hours. It is convenient to arrange this the night before the spraying is to be done. In another barrel place 50 pounds of lime freshly slaked. For this purpose choose clean stone lime of the best quality. Slaking should be done carefully. Water should be added a little at a time so that slaking will take place rapidly. The process should be watched carefully and the mixture stirred constantly while the slaking is going on, adding water as needed to prevent burning, as lime should never be allowed to become dry while slaking or it will burn, nor should it become entirely submerged with water. The mixing can be conveniently done with a hoe. When thoroughly slaked make up to fifty gallons with water.

If small quantities only of stock solution are needed any quantity can be made in the above mentioned proportions. the spray is to be applied to peach trees in foliage use the 3-6-50 formula. It is always best to test the mixture before applying with potassium ferrocyanide.

These stock solutions can be kept for an indefinite time if water is added to replace that lost by evaporation. They should be kept covered to prevent dilution by rains. Made up in this way each gallon of stock solution represents one pound of ingredients. Each should be stirred very thoroughly before any is taken out.

In making up the mixture from these stock solutions both the copper sulphate and the lime should be diluted before being mixed. Have two dilution barrels or tanks. If the 6-6-50 formula be used and the spray tank holds 100 gallons—

take twelve gallons of copper sulphate stock solution and dilute to make fifty gallons in one barrel and take twelve gallons of the lime paste and dilute in the same manner in another barrel. The lime paste should be run through a fine strainer.

For convenience it is well to have a platform built high enough to permit the liquids to flow from the dilution tanks into the spray cart. Allow the two diluted solutions to run together through a twenty-mesh copper wire strainer into the spray tank, mix well and apply at once.

(It is always best to test the mixture before applying with potassium ferrocyanide).

Buy ten cents' worth of potassium ferrocynide at the druggist's and dissolve in the least possible amount of water. Label the bottle poison. Take out a cupful of the well-stirred mixture and allow a drop or two of the potassium ferrocynide to drop into it. If the drop turns yellow or brown on striking the mixture it will be necessary to add more lime. Add lime till no discoloration is seen when tested in this way. If this precaution is not taken the spray may injure the foliage.

Use a good pump that gives strong constant pressure; have good nozzles that give a fine, mist-like spray and cover the tree thoroughly.

Always rinse the spray tank, hose and rod with water after using. Use only brass rods and connections as Bordeaux mixture will gradually attack iron.

Unfortunately, even the most carefully prepared Bordeaux will some times cause serious "russetting" of the fruit of apple. This russetting seems to be the most serious when rainy or at least humid weather prevails at the time of the first spraying after the blossoms fall, and as such conditions do usually thus prevail, at least in the Willamette Valley, "spray injury" following the use of Bordeaux often becomes almost as serious as the fungus injury it was expected to prevent.

(b) *Self-Boiled Lime-Sulfur*. This mixture, introduced and perfected by Scott, of the Department of Agriculture, is especially desirable for use on peach foliage. The experience in most sections of the country has been that Bordeaux mixture and most other fungicides are unsafe to use on peach and other tender foliage. This fact has led to the perfection of the self-boiled lime-sulfur. This mixture, prepared and recommended for use on the peach foliage, is in effect a mechanical mixture of lime and sulfur with only a very small percentage

of sulphides in solution. In Oregon this spray is especially recommended for use against brown rot and fruit spot of peach. The formula recommended is as follows:

Lime, 8 pounds;
Sulfur, 8 pounds;
Water, 50 gallons.

The preparation of the mixture as described by Scott in Bureau of Plant Industry, Bulletin No. 174, is as follows:

"The mixture used in our experiments during the past season was composed of 8 pounds of fresh stone lime and 8 pounds of sulfur (either flowers or flour may be used) to fifty gallons of water. The mixture can best be prepared in rather large quantities, say enough for 200 gallons at a time, making the formula 32 pounds of lime and 32 pounds of sulfur, to be cooked with a small quantity of water (8 or 10 gallons) and then diluted to 200 gallons.

"The lime should be placed in a barrel and enough water poured on to almost cover it. As soon as the lime begins to slake the sulfur should be added after first running it through a sieve to break up the lumps. The mixture should be constantly stirred and more water added as needed to form a thick paste at first and then gradually a thin paste. The lime will supply enough heat to boil the mixture several minutes. As soon as it is well slaked water should be added to cool the mixture and prevent further cooking. It is then ready to be strained into the spray tank, diluted, and applied.

"The stage at which cold water should be poured on to stop the cooking varies with different limes. Some limes are so sluggish in slaking that it is difficult to obtain enough heat from them to cook the mixture at all, while other limes become intensely hot on slaking and care must be taken now to allow the boiling to proceed too far. If the mixture is allowed to remain hot fifteen to twenty minutes after the slaking is completed, the sulfur gradually goes into solution, combining with the lime to form sulphids, which are injurious to peach foliage. It is therefore very important, especially with hot lime, to cool the mixture quickly by adding a few buckets of water as soon as the lumps of lime have slaked down. The intense heat, violent boiling and constant stirring result in a uniform mixture of finely divided sulfur and lime, with only a very small percentage of the sulfur in solution. The mixture should be strained to take out the coarse particles of lime, but the sulfur should be carefully worked through the strainer.

"In applying the self-boiled lime-sulfur mixture, the spraying outfit should be equipped with a good agitator. The

mixture settles to the bottom of the tank, and unless kept thoroughly agitated, cannot be evenly applied."

Since commercial lime-sulfur has caused some burning of fruit and foliage of the apple in some sections of the Northwest, we would suggest that the self-boiled lime-sulfur be tried for the third scab spray. Either the 8-8-50 or 10-10-50 formula may be used. While not as good as the commercial lime-sulfur against apple scab, Scott finds that it will control mild cases of scab, and in his experiments was entirely harmless to foliage and fruit.

Arsenate of lead for codling moth may be safely used with the self-boiled mixture in the same proportions as recommended when mixed with Bordeaux or commercial lime-sulfur.

COMBINED SPRAYS.

It is often desirable and practicable to use sprays which combine both fungicidal and insecticidal qualities. The time, expense and annoyance of one or more sprayings may frequently be eliminated by such combinations. Thus Bordeaux mixture and Paris green, or arsenate of lead, has long been used as a combined spray for apple scab and codling moth and the expense of controlling these two important apple pests has thereby been materially reduced. This spray, however, combines only the fungicidal value of Bordeaux and the food poison value of the arsenical. It is of little or no value as a contact insecticide—in other words, it is of no value against scale insects, plant lice and other sucking insects.

During the past four years we have conclusively demonstrated that the lime-sulfur spray, which has long been known as the most satisfactory winter spray for San Jose scale, has fungicidal qualities nearly or quite equal to those of Bordeaux. We have also conclusively demonstrated that it may be used in combination with arsenate of lead without detracting from the value of either; and that when so used it is at once an efficient contact insecticide, food poison spray, and fungicide.

It also has the advantage that when properly diluted it may be used either as a winter or summer spray.

As a winter spray one application of lime-sulfur spray each year will do more for the neglected orchard than can be done in any other way by the same expenditure of cash and energy. It not only destroys San Jose scale, but it also destroys the branch form of woolly-aphis, the eggs of the green-

aphis, the pear-leaf blister mite, the hibernating larvae of the prune twig-miner, probably the hibernating larvae of the bud-moth, together with most other insects which may chance to be wintering upon the trees. It is also a good fungicide. If applied in fall it is nearly or quite equal to Bordeaux as a preventive of apple tree anthracnose; applied to peach trees just before the buds open in the spring, it is a preventive of peach leaf curl.

As a summer spray the results of the past four seasons' work at the Oregon Experiment Station prove conclusively that when properly diluted it can be safely used upon the apple, pear, plum and prune, potato, celery and other hardy plants, and that it gives better results in controlling apple scab than does Bordeaux, which has been the standard spray for this disease, and further that it is much less likely to produce the disastrous "spray injury" to fruit and foliage which is so common and often serious when Bordeaux is used.

PREPARATION OF LIME-SULPHUR. The "stock solution" method of preparing lime-sulfur spray is now most generally used in this state. A number of brands of commercial solutions which have only to be diluted with water to be ready for use are now offered for sale, and careful experiments extending over several seasons have demonstrated that these sprays are fully equal to the old home-made lime-sulfur spray.

The chief fault to be found with these commercial preparations is that they cost too much. The retail price is \$7 to \$10 per barrel of fifty gallons. The lime and sulfur necessary to prepare fifty gallons of stock solution, which is equally as efficient, costs at present retail prices approximately \$3. It may be prepared as follows;

Sulfur (best finely ground), one sack, 110 pounds;

Lime (best grade, unslaked), 60 pounds;

Water sufficient to make, 60 gallons.

Slake the lime, mix the sulfur into a thin paste with a little water, add it to the lime, add sufficient water to make all told sixty gallons; bring it to a boil and boil vigorously for thirty to forty-five minutes, stirring constantly. The sediment is then allowed to settle, after which the clear, amber-colored liquid is drawn off and may be stored in tanks for future use.

Every grower who expects to prepare his own spray by the stock solution method should provide himself with a Beaume's acid scale hydrometer. Such an instrument, which should not cost over \$1, furnishes a very simple and convenient

method of testing the strength of the solution. Having thus determined the strength of any commercial or home-made stock solution, it may be diluted for winter or summer use according to the following table: i. e., If stock solution tests 29 degrees for winter spray use one gallon to nine and a half gallons of water; for summer spray use one gallon to twenty-nine gallons of water. If stock solution tests 31 degrees, for winter spray use one gallon to eleven gallons of water, or for summer spray one gallon to thirty-one gallons of water.

TABLE OF DILUTIONS FOR VARIOUS STOCK SOLUTIONS.

Stock Solution Beaume Scale	Dilution	Dilution
	Winter Strength	Summer Strength
32°	1-12	1-32
31°	1-11	1-31
30°	1-10	1-30
29°	1-9½	1-29
28°	1-9	1-28
27°	1-8½	1-27
26°	1-8	1-26
25°	1-7½	1-25
24°	1-7	1-24
23°	1-6½	1-23
22°	1-6	1-22

WHEN TO SPRAY.

General directions as to how many times to spray and when the applications should be made are at best unsatisfactory. The answer to both questions depends not only upon the variety of fruit to be sprayed, but also upon the conditions prevailing in the orchard to be sprayed, and the relative importance of the orchard crop to other crops. The orchardist can afford to do more spraying than can the farmer, but usually obtains satisfactory results with fewer applications—first, because he is ordinarily better equipped for the work and has a better knowledge of why he sprays; and, second, because his orchard is usually less seriously infested owing to the better care it has received.

An almost universal practice in this state—and a good one—is to spray the orchard, whatever the kind of fruit, with lime-sulfur at some time when the trees are dormant. While this application is made primarily for San Jose scale, we be-

lieve there is no other which has such a generally beneficial result. It is the annual "house-cleaning" of the orchards.

The best time for this winter spraying is immediately after the leaves drop in Fall—even before they are all off—or just before the buds open in Spring. Personally, we would prefer the latter were the orchard seriously infested with *San Jose scale*; the former were it badly infested with anthracnose.

It should be noted, however, that since the introduction of the use of lime-sulfur as a Spring and early Fall spray for apple scab and apple tree anthracnose that there is much less need of winter applications. In fact, whenever the spring and fall applications of lime-sulfur are made, all winter spraying may be omitted, except in the case of orchards which have been badly neglected.

In the following pages we have briefly outlined the applications which would be advisable in a theoretical orchard which is supposed to be infested with all of the important pests which are known to occur in the state. In practice it will be rare, indeed, that any orchard will need all of the sprayings indicated, but in view of the fact that this circular is for distribution in all sections of the state with their widely varying conditions, about all that we can do is to outline a theoretical number of sprayings, and to reiterate the suggestion which was made at the beginning, that "it is of prime importance that every fruit grower should know what diseases and insects are prevalent in his district and be able to recognize them."

APPLE.

TREATMENT FOR YOUNG ORCHARD. It is advisable to spray a young orchard twice each year for the purpose of preventing any insect pests or diseases from becoming established.

First, spray with lime-sulfur, summer strength, at the time when bearing trees are just coming into bloom. (Corresponds to the first scab spray for bearing trees). If aphids are troublesome, add black-leaf or black leaf 40 according to formula given above.

Second, spray shortly after the Fall rains begin, or about the first of October, using either Bordeaux mixture 4-4-50 or the lime-sulfur, summer strength.

TREATMENT FOR BEARING ORCHARD. *First*, spray with lime-sulfur, summer strength, just as the blossom buds begin

to separate in the cluster and show color, or slightly before. This is the first spray for *apple scab*. In case *bud moth* or other leaf-eating insects are present, add arsenate of lead in the proportion of two pounds to each fifty gallons of spray. If *aphids* are troublesome, add black-leaf or black-leaf 40 as above.

Second, spray with lime-sulfur, summer strength, to which two pounds of arsenate of lead has been added to each fifty gallons just after the petals have fallen. This is the second *scab* and the first *codling moth* spray.

Third, in orchards that are badly infested with *apple scab*, spray ten days or two weeks after the second with lime-sulfur, summer strength, or with self-boiled lime-sulfur (8-8-50). This is distinctly a *scab* spray and in regions where *scab* is not prevalent may be omitted. Where *codling moth* or leaf-eating insects are present, two pounds of arsenate of lead should be added to each fifty gallons of spray. In those sections of the state where *scab* is not present and it is necessary to spray for leaf-eating insects, arsenate of lead may be diluted with water in the proportion of two pounds to fifty gallons.

Fourth, the second spray for *codling moth* should be applied at the time the moths are depositing eggs for the first generation, or just as the very earliest worms are beginning to enter the fruit. In the greater portion of the Willamette Valley this will be usually between June 25th and July 1st, although the dates may vary somewhat with the season. This date is also approximately correct for most portions of the Hood River Valley, but in Southern Oregon and the warmer parts of the Grande Ronde Valley this application should be made somewhat earlier. Use two pounds of arsenate of lead to fifty gallons of water.

Fifth, an application of arsenate of lead should be applied as a preventive of injury by *codling moth* about four or five weeks after the fourth. In the Willamette Valley this will be about August 1st.

Sixth, soon after the Fall rains begin, or about October 1st, it is advisable to spray with summer strength lime-sulfur as a preventive of *apple tree anthracnose*. If *bud moth* has been prevalent, add arsenate of lead in the proportion of two pounds to fifty gallons of spray.

Seventh, as soon as possible after the fruit is harvested, spray with Bordeaux mixture 6-6-50 or lime-sulfur, winter

strength, as a preventive against *anthracnose*. It is also possible that this and the preceding spray will have a beneficial effect in reducing the spread of *apple scab* on the foliage and fruit, which frequently is a serious trouble in the Fall in some sections of the Northwest.

PEAR.

The first, second and third sprays for the pear correspond to those recommended for apple where the *pear scab* is prevalent. If only *codling moth* is present then spray as recommended under the second, fourth and fifth sprays for apple.

For the pear no Fall spray is necessary, except where the *bud moth* is prevalent. In that case use arsenate of lead two pounds to fifty gallons of water September 15 to October 1.

PEACH.

First, spray with lime-sulfur, winter strength, just as the buds are swelling in Spring, but before terminal buds show any green color. This application, if thoroughly made, will prevent *peach leaf curl*, and destroy *San Jose scale*. This is the most important single spray for the peach.

Second, if the *peach spot* has been serious, spray in Spring after fruit is set with self-boiled lime-sulfur 8-8-50. (The time for this application is about May 10th for Southern Oregon, correspondingly later for other sections).

Third, apply self-boiled lime-sulfur 8-8-50 about three weeks after the second. If the *powdery mildew* of the peach appears, frequent applications of self-boiled lime-sulfur should be tried as a remedy, beginning as soon as petals fall, spraying at intervals of ten days. If the disease becomes firmly established, cut back severely and spray as suggested.

Fourth, where *California peach blight* is prevalent, spray with Bordeaux mixture or lime-sulfur, winter strength, in Fall about November 1st. It is possible that ordinary cases of *fruit spot* will be kept under control by this Fall application rendering the second and third applications unnecessary except in clearing up an orchard in which the trouble has become firmly established. It is probable that the second and third sprays as recommended above would also answer for holding *brown rot* in check. In case *brown rot* is serious, another application of self-boiled lime-sulfur is recommended about one month before the fruit ripens.

Only the first and fourth sprays mentioned will be necessary under ordinary conditions in Oregon since the *brown rot* is not commonly very serious. The Spring sprayings for *fruit spot* are considered necessary only in cleaning up an orchard in which this disease has become firmly established, since the so-called *California peach blight* and *fruit spot* are caused by the same fungus.

PLUM AND PRUNE.

Ordinarily one spraying with lime-sulfur, applied to prune and plum trees during the dormant season, is sufficient. Where *brown rot* is prevalent, however, the following should be given in addition to the dormant spray:

First, three or four weeks after petals fall spray with Bordeaux mixture or lime-sulfur, summer strength.

Second, repeat after three weeks.

Third, repeat one month before fruit ripens.

CHERRY.

The cherry rarely needs more than one application of spray, and this should be applied during the dormant season, preferably when buds begin to swell. If, however, the *shot hole fungus* is serious, the following method is recommended:

First, spray with either Bordeaux mixture 3-4-50, lime-sulfur 1-40 (basis of 30° Beaume stock solution) or self-boiled lime-sulfur 10-10-50 about a month after blossoming.

Second, repeat as soon as the fruit is picked.

Third, repeat about three weeks to one month after second.

If *brown rot* is present in a serious enough form to warrant spraying, apply either of the above mentioned sprays:

First, one week after petals fall.

Second, repeat three weeks later.

Whenever *cherry slugs* become troublesome, spray with arsenate of lead two pounds to fifty gallons. .

NOTICE.

Copies of the following Circular Bulletins will be sent to all who apply for them:

Crop Pest Series 1. Fire Blight of Apple and Pear.

Crop Pest Series 2. Three Species of Apple Plant Lice in Oregon.